E. S. HOYT.

OIL GAS GENERATOR.

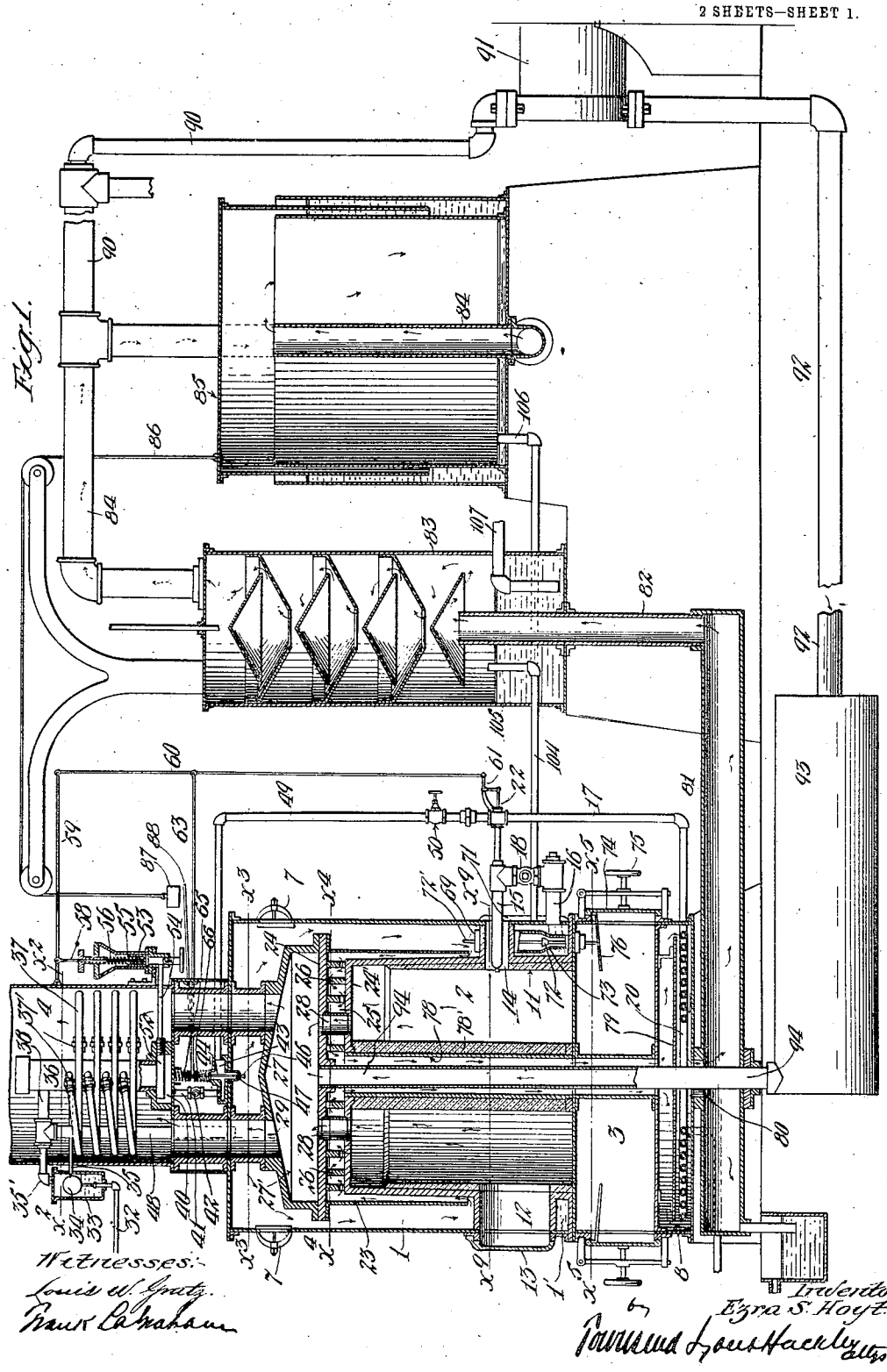
APPLICATION FILED APR. 24, 1909.

1,017,214.

Patented Feb. 13, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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2 SHEETS—SHEET 2.

Fig. 3.

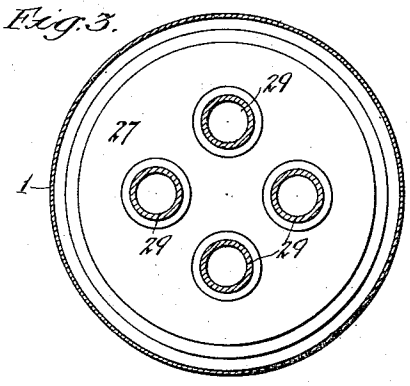


Fig. 2.

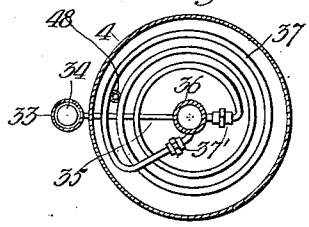


Fig. 4.

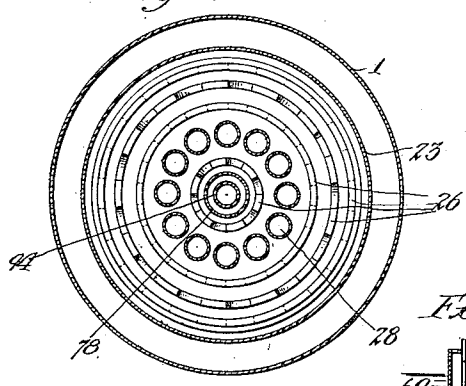


Fig. 5.

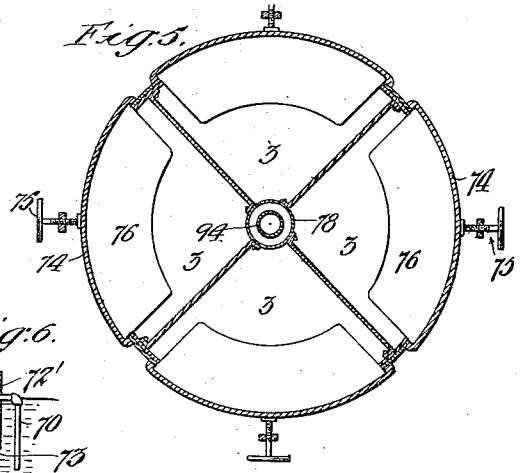


Fig. 6.

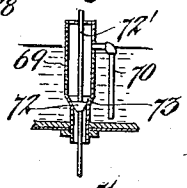


Fig. 9.

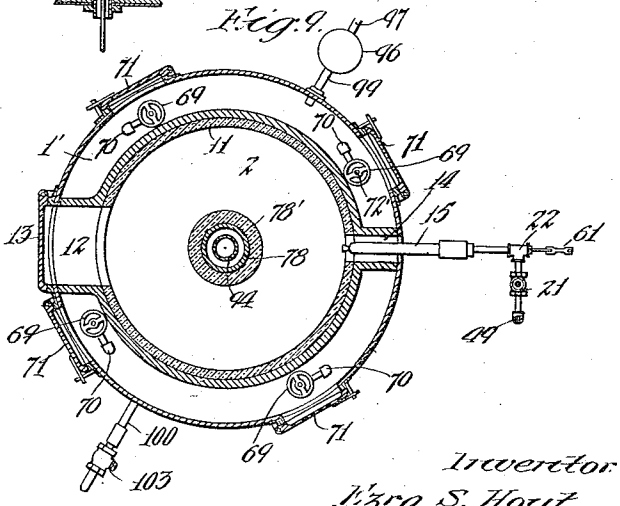


Fig. 8.

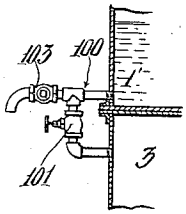
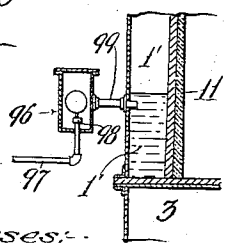


Fig. 7.



Witnesses:-

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by

Brownell & Mitchell

attys

UNITED STATES PATENT OFFICE.

EZRA S. HOYT, OF LOS ANGELES, CALIFORNIA.

OIL-GAS GENERATOR.

1,017,214. Specification of Letters Patent. Patented Feb. 13, 1912.

Application filed April 24, 1909. Serial No. 492,080.

To all whom it may concern:

Be it known that I, EZRA S. HOYT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Oil-Gas Generator, of which the following is a specification.

This invention is strictly intended for the generation of gas from petroleum and particularly crude petroleum such as is found in California.

One object of the present invention is to provide for the maximum production of gas with a minimum of waste.

Another object of the invention is to provide for the production of a gas rich in illuminants and thermal units.

A further object of the invention is to provide a gas generator which will economize heat as far as possible.

Another object of the invention is to utilize the tar produced as a by product in the gas making operation, as a combustible for supplying the heat required in the operation.

Another object of the invention is to provide for utilizing any tar produced in excess of the demands of the heating operation in the production of gas and coke.

Another object of the invention is to utilize in the gas production the waste heat from a power plant using the gas from the generator.

Another object is to furnish a continuous gas formation thermostatically controlled that will make gas as needed for use in a gas engine.

Other objects of the invention will appear hereinafter.

The accompanying drawings illustrate the invention.

Figure 1 is a vertical section of the apparatus. Fig. 2 is a horizontal section on the line x^2—x^2 in Fig. 1. Fig. 3 is a horizontal section on the line x^3—x^3 in Fig. 1. Fig. 4 is a horizontal section on the line x^4—x^4 in Fig. 1. Fig. 5 is a horizontal section on the line x^5—x^5 in Fig. 1. Fig. 6 is a detail vertical section of the outlet means from the tar tank. Fig. 7 is a detail vertical section of the oil inlet to the tar tank. Fig. 8 is a detail vertical section of a supplementary outlet means for the tar tank. Fig. 9 is a horizontal section on line x^9—x^9 in Fig. 1.

The generator comprises a retort or shell 1, a combustion chamber or shell 2 located within the shell 1, a coking chamber 3 located beneath said shells, an extension 4 at the top of the shell 1 and serving as a stack for carrying off the products of combustion and oil heating means located in said extension.

The shell 1 may be a cylindrical upright shell having manholes 7, said shell being secured on top of the chamber 3 which in turn rests on the base 8; said base is utilized as a pre-heating air or steam chamber, as hereinafter described, and the chamber 3 is utilized as a means for coking the tarry products from the oil and gas.

The combustion chamber or shell 2 rests directly on top of the chamber 3 and may be provided with a refractory lining indicated at 11 inside the walls thereof. At one side this combustion chamber is provided with a lateral extension 12 having a door 13 opening at the outside of the outer chamber 1 to enable inspection of and access to the combustion chamber. At another portion the combustion chamber has a lateral extension 14 extending to the outside of the outer chamber 1, said extension receiving the oil or tar burner 15 for maintaining the combustion within the combustion chamber. Said oil or tar burner is supplied with combustible through a pipe 16 and with air or steam through a pipe 17.

As fuel for the burner I prefer to use the residuum or tarry matter produced as a by-product in the operation. For this purpose the pipe 16 communicates with the space herein termed the tar tank 1′ between the lower portions of the outer shell 1 and the combustion chamber shell 2, this being the space within which the tar accumulates. A valve 18 may be provided in this pipe 16. The air or steam for the burner is preferably pre-heated by passing through a coil 20 located in the base chamber 8 and connected to any suitable source of compressed air or steam, not shown. A manual valve 21 is provided for the air or steam supply and an automatic valve 22 is also provided, controlled by thermostatic means to maintain or produce a definite or requisite temperature within the combustion chamber or within the generating and expanding chamber.

The generator and expanding chamber

surrounds the combustion chamber and also surrounds a fixing chamber or chambers, intermediate between the combustion chamber and the generating chamber. The intermediate shell 23 depends from a supplementary top plate 24 supported above the top of the combustion chamber so as to leave an intervening space 25 at the top and at all sides of the combustion chamber, this space serving as a fixing chamber. Flanges 26, alternately extending upward from the top of the combustion chamber and from the bottom of the supplementary top plate 24 serve as baffle plates or deflectors for the gas. A cap plate or dome 27 resting at its rim on the supplementary top plate 24 forms a supplementary chamber 27′ for the products of combustion, said chamber communicating by pipes or ducts 28 extending through the intermediate fixing chamber or space to the combustion chamber and said supplementary chamber communicating, by risers or stack pipes 29 extending upwardly therefrom, into the main stack or outlet portion 4 of the generator casing. The top 27 of this supplementary chamber is conical to serve as a splash or drip plate if required for the oil to be vaporized.

In the present invention the gas is produced from the oil by first pre-heating the oil to a certain temperature while maintaining the same under condition of considerable pressure and then releasing the oil into the generator chamber with compressed air or steam as an atomizing force so that the oil flashes into vapor by its own vapor tension, and the force of air or steam thereby producing a maximum amount of gas production and the minimum breaking up effect on the oil constituents.

The oil supply enters the apparatus through a pipe 32 leading from a suitable source, a regulating device 33 being provided in this oil connection controlled by a float 34 to maintain a definite level of oil in the chamber or device 33. The outlet pipe 35 leads from this chamber at about the oil level to a vertical, tubular pipe 36 extending within the upper or stack portion 4 of the casing of the apparatus. Coils of piping 37 are arranged in a plurality of superimposed spirals the inner end of each spiral being connected to the vertical pipe 36 and the outer end of each spiral coil being connected to said vertical pipe at the point somewhat above the first named connection, so as to provide for automatic circulation of the oil between the coils and the vertical, tubular pipe 36, the connections being made by unions 37′ to provide for removal of any section independently of the others.

Vent connections 35′, 38 extend from the regulating device 33 and from the upper part of the vertical pipe 36 to a pipe 48 which extends down into the generator chamber 1 so as to convey to the generator chamber any oil vapor that may be generated in the aforesaid parts of the apparatus.

The vertical pipe 36 opens at its lower end into a chamber 40 and from said chamber a pipe 41 provided with a manual valve 42 extends to a valve box 43 mounted on top of the casing or shell 1. A valve stem 44 is slidably mounted in said valve box 43 in a guide on the top of the box 43, said valve stem carrying a conical valve 46 coöperating with a valve seat 47 extending within the shell 1. The said valve 46 controls communication between the interior of valve box 43 and the interior of shell 1, so as to control supply of oil to the generator chamber. An air or steam supply connection or pipe 49 is provided to the valve box 43, said connection leading, for example, from the air supply pipe 17 to the oil burner 15 and being provided with a manual valve 50.

Thermostatic means are provided for controlling both the supply means for the burner and the generator supply, responsively to the condition of temperature in the oil preheating chamber. For this purpose any suitable similar thermostatic means may be used, for example, the one shown in the drawing, comprising a tube 52 inclosed within the chamber 40 at the bottom of oil pipe 36, a cylinder 53 connected to said chamber 52 by pipe 54, a piston, diaphragm or other means 55 in said cylinder and operated by the pressure of the fluid therein, and a spring 56 resisting such operation. The special construction of this thermostatic device is disclosed in Patent No. 581,556, granted to me Apr. 27, 1897. Rod and lever connections 58, 59, 60 and 61 connect this thermostatic device with the automatic valve 22 of the oil burner and a lever connection 63 is provided from the rod 60 to the valve stem 44 of the generator valve 46. Springs 65 and 66 operate on the valve stem 44 to hold the same in normal position.

Means are provided for allowing overflow of the tar accumulating in the lower part of the generator chamber 1, said means consisting of a tube 69 extending upwardly from the bottom of the generator chamber and having a downwardly extending tube 70 opening into its side and reaching below the tar level, said tube formed at its upper end with a guide for a valve stem 72′ carrying a valve 72 coöperating with a conical valve seat 73 in the tube, said valve controlling communication to the chamber 3 from the upper part of the tube. The seat 73 is prolonged to extend within the chamber 3. Tube 69 is open at its top and is large enough to prevent it from being clogged with tar and to permit any gas or vapor generated in chamber 3 to pass up into the generator chamber. A door 71 provides for access to each tar valve. A plurality of doors

74 are provided disposed around the coking chamber 3, said doors being provided with means 75 for clamping them in position and being further provided with inwardly extending, downwardly inclined, aprons 76. One of these aprons is positioned to engage under each stem 72′, aforesaid to raise the tar valve when the door is closed and to allow the tar valve to close when the door is opened or removed. A supplementary oil supply means 96 is provided, comprising a chamber connected to an oil supply pipe 97 and provided with a float controlled valve 98 said chamber having an outlet pipe 99 leading into the tar tank at the lower part of chamber 1 somewhat below the normal tar level. Normally the tar stands at the level of the opening of tube 70 into the overflow tube 69, this being substantially the level of the burner, so that tar will flow to the burner. But if the supply of tar is insufficient, so that the level falls below this outlet, the valve 98 will open to allow oil to flow to the tar tank and thence to the burner. It will be noted that the siphon tube 70 takes the heavier tar from the bottom of the tar tank.

A by pass 100 is provided from tar tank 1′ to the coking chamber, the by pass being normally closed by a valve 101, which may be opened if the overflow becomes choked, to allow the tar to pass to the coking chamber. Draw off valve 103 may also be provided from the tar tank to enable the tar to be drawn off for use, if desired.

The intermediate or fixing chamber communicates, at the portion thereof which is at the center of and between the top plates of the combustion and fixing chambers, with a final fixing chamber formed as a tube 78, having a refractory covering 78′ extending downwardly from the said top plate 24′ of the combustion chamber, and opening at its lower end into the hollow base 8 of the generator, a baffle plate 79 being provided to spread the descending gas. At the bottom of said base below the air superheating coil 20, an outlet pipe 80 opens into the conduit 81 from which a riser 82 extends up into the scrubber 83, said scrubber communicating by a pipe 84 with the reservoir or gasometer 85. A mechanical connection consisting, for example, of a cable 86 is provided from the bell of this gasometer to a weight 87, which when the gasometer rises to a definite extent, engages a lever 88 connected to the generator oil valve stem 44 to close the oil valve.

A pipe 104 for conveying tar leads from the tar tank at the lower part of the generator chamber 1 and communicates by risers 105, 106 respectively, with the lower part of the scrubber and to the lower part of the gasometer, the height of these risers being such as to maintain the proper level within the respective devices. 107 designates a water outlet pipe for the scrubber.

In case the generator is used as a part of a gas engine power plant, the service 90 from the gasometer is connected to the intake of the engine, indicated at 91, and the exhaust from the engine is connected by a pipe 92 with a storage or muffler tank 93 from which a riser 94 extends upwardly within the final fixing tube 78 aforesaid so that the exhaust is delivered underneath the heating plate or cap 27 and passes into a stack 4, the heat of the exhaust from the gas engine being thus utilized in fixing and generating the gas and in preheating the oil.

The operation is as follows: The thermostatic device 52 cuts off the supply of oil to the generator at times when the generator is not in operation. In starting up the generator the burner 15 is set in operation to heat the combustion chamber 2 and said combustion chamber heats the surrounding fixing chamber 25 and generator chamber 1. The products of combustion pass up through the ducts 28, top chamber 27′, risers 29 to stack 4, whence they pass off through any suitable chimney or stack means. In the stack portion 4 the hot products of combustion heat the oil contained in the coils 37 and vertical pipe 36. When the oil has become sufficiently heated in this manner it operates through the thermostatic device 52, etc. to turn on the oil supply at valve 46. The oil at said valve is under a hydrostatic head represented by the difference in level between the outlet of the valve and the inlet pipe 35 and the temperature of the oil is so high that the vapor tension of the oil assists the air or steam to flash the oil substantially into vapor as it issues from the outlet of valve 46. The oil vapor passes over the heated cap 27 and down at the side of the depending wall or shell 23 under the bottom of said shell upwardly from said shell and the wall of the combustion chamber 2 over the top of the combustion chamber between the deflector plates 26 and then down through the final fixing chamber or pipe 78 to the hollow base chamber 8, thence through pipe 81 to the scrubber and from the scrubber to the gasometer. In passing down around the shell 23 and up around and over the combustion chamber the vapor is fixed into gas and the tarry matter is deposited in the lower part of the generator chamber and overflows through the means 69 into the coking chamber 3, falling onto the apron 76 of said chamber and thence onto the floor of the chamber, this tarry matter being gradually consolidated or partially coked by the action of the heat. This heat is supplied by the outflowing gas passing down through pipe 78 and out through chamber 8 under the coking oven or chamber 3.

The tarry matter, if any, collects in the holder and in the scrubber and will flow back to the generator chamber through the connections 104, 105, 106. Any surplus of the tar which is not burned in the burner 15 accumulates in the coking oven or chamber 3 when it is boiled, until the volatile matter is passed up in gas and the solid matter is reduced to hard coke. The gas rises to chamber 1 and the coke accumulates in chamber 3, and may be removed from time to time by opening the doors of the coking oven and cutting out the coke. It will be noted that when the doors 74 are opened the support is removed from the tar valve 72 and the latter closes, so that no tar flows into the chamber while it is being cleaned.

It will be seen that in the above described operation the heat generated by the burning of the tar is, first used in fixing gases, then for generating gases from the heated oil, then for preheating the oils and driving off the lighter gases in a stack through which the products ascend, that the heat generated by exploding of gas in engine cylinder is entirely used and gases generated thereby returned to engine and holder, the heat being first applied to the final fixing chamber, then to the generating chamber therein, and then passing through the stack, preheating and driving off gases from the oil as it comes in the opposite direction from the stack to the generating chamber. Again as the hot gas is conducted from the fixing chamber the heat thereof is applied to the coking oven reducing balance of tar to coke there, and is also applied to heating air or steam coils before it is conducted to the scrubber, thereby conserving and returning to the generator all the available heat generated therein and in the engine cylinder.

In the above described operation the oil is distilled or separated into its constituents by passing it successively from a part of relatively low temperature to chambers of successively high temperature, so that the more volatile parts of the oil are successively discharged therefrom, and are subsequently collected together in the expanding and generating chamber 1, and the gas so produced being then fixed.

The gas passing downwardly from the generating chamber through the pipe 78 is heated both from the outside by the combustion chamber 1 and from the inside by the internal pipe 94, connected to the exhaust of the gas engine, so that there is no liability of a "core" of unfixed gas descending at the center of the pipe.

What I claim is:—

1. A gas generator comprising a generating and expanding chamber, means for applying heat to the walls of said chamber, means for preheating oil to a temperature sufficient to cause vaporization of the lighter part of the oil and to cause expansion into vapor of the heavier part of the oil when released from said chamber, said preheating means having a vent communication from the upper part of said preheating means to the generating and expanding chamber to allow the vapor generated in said preheating means to pass to the said chamber, and atomizing valve means controlling the supply of heated oil from the lower part of the preheating means to the generating and expanding chamber to allow the heavier portion of the oil to be atomized and vaporized in the generating and expanding chamber.

2. A gas generator comprising a generating and expanding chamber, means for applying heat to the walls of said chamber, means for preheating oil to a temperature sufficient to cause vaporization of the lighter part of the oil and to cause expansion into vapor of the heavier part of the oil when released from said chamber, said preheating means having a vent communication with the generating and expanding chamber to allow the vapor generated in said preheating means to pass to the said chamber, atomizing valve means controlling the supply of heated oil from the preheating means to the generating and expanding chamber to allow the heavier portion of the oil to be atomized and vaporized in the generating and expanding chamber, thermostatic means controlling said atomizing valve means responsively to the temperature in said preheating means and elastic fluid supply means for injecting the oil into the generating chamber.

3. A gas generator comprising a generating and expanding chamber, means for applying heat to the walls of said chamber, means for preheating oil to a temperature sufficient to cause vaporization of the lighter part of the oil and to cause expansion into vapor of the heavier part of the oil when released from said chamber, said preheating means having a vent communication with the generating and expanding chamber to allow the vapor generated in said preheating means to pass to the said chamber, atomizing valve means controlling the supply of heated oil from the preheating means to the generating and expanding chamber to allow the heavier portion of the oil to be atomized and vaporized in the generating and expanding chamber, thermostatic means controlling said atomizing valve means responsively to the temperature in said preheating means, a deflecting means located in the chamber below the oil supply means, and means for heating said deflecting means.

4. A gas generator comprising a generating and expanding chamber, means for applying heat to the walls of said chamber, means for preheating oil to a temperature

sufficient to cause vaporization of the lighter part of the oil and to cause expansion into vapor of the heavier part of the oil when released into said chamber, said preheating means having a vent communication with the generating and expanding chamber to allow the vapor generated in said preheating means to pass to the said chamber, atomizing valve means controlling the supply of heated oil from the preheating means to generating chamber to allow the heavier portion of the oil to be atomized and vaporized in the generating and expanding chamber, thermostatic means controlling said atomizing valve means responsively to the temperature in said preheating means, elastic fluid supplying means for injecting the oil into the generating chamber, and deflecting means located in the chamber below the oil supply, and means for heating said deflecting means.

5. A gas generator comprising a generator chamber, a combustion chamber inclosed therein, a burner provided with means for supplying combustible and air thereto and extending into communication with the combustion chamber, outlet means communicating with the combustion chamber to carry off the products of combustion therefrom, an oil preheater inclosed within said outlet means for the products of combustion, a vent communication from the preheater to the generating and expanding chamber, an oil supply valve connected with said preheater and communicating with the generator chamber to supply oil thereto, and means for drawing off gas from the generator chamber.

6. A gas generator comprising a generator chamber, a combustion chamber inclosed therein, a burner provided with means for supplying combustible and air thereto and extending into communication with the combustion chamber, outlet means communicating with the combustion chamber to carry off the products of combustion therefrom, an oil preheater inclosed within said outlet means for the products of combustion, an oil supply valve connected with said preheater and communicating with the generator chamber to supply oil thereto, means for drawing off gas from the generator chamber, and deflector means extending beneath said oil supply valve and above the combustion chamber to heat the oil or vapor from the valve by heat supplied from the combustion chamber.

7. A gas generator comprising a generator chamber, a combustion chamber inclosed therein, a burner provided with means for supplying combustible and air thereto and extending into communication with the combustion chamber, outlet means communicating with the combustion chamber to carry off the products of combustion therefrom, an oil preheater inclosed within said outlet means for the products of combustion, an oil supply valve connected with said preheater and communicating with the generator chamber to supply oil thereto, means for drawing off gas from the generator chamber, and a fixing chamber intermediate the combustion and generator chamber, said fixing chamber surrounding the combustion chamber and being surrounded by the generator chamber.

8. A gas generator comprising a generator chamber, a combustion chamber inclosed therein, a burner provided with means for supplying combustible and elastic fluid thereto and extending into communication with the combustible chamber, outlet means communicating with the combustion chamber to carry off the products of combustion therefrom, an oil preheater inclosed within said outlet means for the products of combustion, an oil supply valve connected with said preheater and communicating with the generator chamber to supply oil thereto, means for drawing off gas from the generator chamber, a fixing chamber intermediate the combustion and generator chamber, said fixing chamber surrounding the combustion chamber and being surrounded by the generator chamber, and deflecting means extending within said fixing chamber.

9. In a gas generator, the combination with a generator chamber, means for heating the generator chamber comprising a burner, oil supply means for the burner, means for supplying elastic fluid to said burner, preheating means for said elastic fluid supply, and outlet means for drawing off the gas from the generator chamber, said outlet means being in heating relation to said preheating means to heat the elastic fluid passing to the burner.

10. A gas generator comprising a combustion chamber, a generating chamber surrounding the combustion chamber and extending over the combustion chamber, an outlet means for the generating chamber extending downwardly through the combustion chamber, in combination with a gas engine connected to said outlet to receive gas therefrom and an exhaust connection from said gas engine leading upwardly through the outlet of the generating chamber, whereby the waste heat from the engine serves in conjunction with heat from the combustion chamber to fix the gas.

11. A gas generator comprising a combustion chamber, a generating chamber surrounding the combustion chamber, an oil preheater, outlet means from the preheater to the generating chamber, an outlet means for the generating chamber extending downwardly within the combustion chamber, in combination with a gas engine connected to the outlet of the generating chamber to re-

ceive gas therefrom, an exhaust connection from the gas engine leading upwardly through the outlet from the generating chamber and outlet means communicating with the combustion chamber and with the exhaust connection and extending in heating relation, first to the generating chamber and then to the oil preheater, whereby the waste heat from the engine, in conjunction with heat from the combustion chamber serves first to fix the gas then to generate the gas and subsequently to preheat the oil.

12. A gas generator provided with a combustion chamber and with oil supply means, means for utilizing the heat produced in the combustion chamber, first, in fixing the generated gas, then in generating the gas from the oil, and subsequently in preheating the oil used in the said generation of gas.

13. A gas generator comprising a generator chamber, means for supplying oil thereto, a combustion chamber in heating relation therewith, a burner for heating the combustion chamber, connected to receive the tarry products from the generator chamber, and a coking chamber communicating with the generator chamber to receive the surplus tar from the generator chamber.

14. A gas generator comprising a generator chamber, means for supplying oil thereto, a combustion chamber in heating relation therewith, a burner for heating the combustion chamber, connected to receive the tarry products from the generator chamber, and a coking chamber connected to receive the surplus tar from the generator chamber, said generator chamber being provided with an overflow connection into said coking chamber.

15. A gas generator comprising a generator chamber, means for supplying oil thereto, a combustion chamber in heating relation therewith, a burner for heating the combustion chamber, connected to receive the tarry products from the generator chamber, and a coking chamber connected to receive the surplus tar from the generator chamber, said generator chamber being provided with an overflow connection into said coking chamber, and said coking chamber being provided with distributing means below the said overflow connection.

16. A gas generator comprising a generator chamber, means for supplying oil thereto, a combustion chamber in heating relation therewith, a burner for heating the combustion chamber, connected to receive the tarry products from the generator chamber, a coking chamber connected to receive the surplus tar from the generator chamber, said generator chamber being provided with an overflow connection into said coking chamber, and said coking chamber being provided with distributing means below the said overflow connections, and movable doors for the coking chamber supporting said distributing means.

17. A gas generator comprising a generator chamber, means for supplying oil thereto, a combustion chamber in heating relation therewith, a burner for heating the combustion chamber, connected to receive the tarry products from the generator chamber, a coking chamber connected to receive the surplus tar from the generator chamber, said generator chamber being provided with an overflow connection into said coking chamber, and said coking chamber being provided with distributing means below the said overflow connection, and movable doors for the coking chamber supporting said distributing means, the said overflow connections being provided with valves engaged by said distributing means to open the valves when the doors are closed.

18. A continuous oil distilling and gas generating means comprising a combustion chamber, a generating chamber surrounding the combustion chamber, a fixing chamber within the combustion chamber, oil preheating means, means for applying the heat from the combustion chamber to first heat the fixing chamber, then the generating chamber and then the oil preheating means, means for spraying the oil from the preheating means into the generating chamber, means for conducting the vapor from the oil preheating means for the generating chamber and means for conducting the vapors from the generating chamber to the fixing chamber.

19. A continuous oil distilling and gas generating apparatus comprising means for generating gas from oil by the application of heat to the oil, in combination with a gas engine connected to the gas generating means to receive gas therefrom, an exhaust connection from the gas engine in heating relation to the gas generating means to supply heat for generating and fixing the gas from the oil and a muffling chamber in said exhaust connection to equalize the pressure therein.

20. An oil distilling and gas generating means comprising means for subjecting oil to heat to separate it into gas and residuum, means for burning such residuum, means for applying the heat from such combustion to the generating means to heat the oil for producing gas and residuum, and means for subjecting another part of such residuum to heat to produce gas and coke therefrom.

21. An oil distilling and gas generating apparatus comprising means for preheating oil, generator means for receiving and expanding preheated oil to form gas, burner means for heating the generating and preheating means, and thermostatic means controlled by the temperature of the oil in a

part of the preheating means and controlling the supply of oil to the generator means.

22. An oil distilling and gas generating apparatus comprising means for preheating oil, generator means for receiving and expanding preheated oil to form gas, burner means for heating the generating and preheating means, and thermostatic means controlled by the temperature of the oil in a part of the preheating means and controlling the supply of fuel to the burner means.

23. An oil distilling and gas generating apparatus comprising means for preheating oil, generator means for receiving and expanding preheated oil to form gas, burner means for heating the generating and preheating means, and thermostatic means controlled by the temperature of the oil in a part of the preheating means and controlling the supply of oil to the generating and fuel to the burner means.

24. A continuous oil distilling and gas generating apparatus comprising means for generating gas from oil by the application of heat to the oil, in combination with a gas engine connected to the gas generating means to receive gas therefrom, an exhaust connection from the gas engine in heating relation to the gas generating means to supply heat for generating and fixing the gas from the oil, burner means to furnish additional heat to the generating means, and thermostatic means for controlling such additional heat by the temperature in parts of the generating apparatus and controlling the supply of oil to the generating means.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 30th day of March 1909.

EZRA S. HOYT.

In presence of—
ARTHUR P. KNIGHT,
FRANK L. A. GRAHAM.